

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

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Claim 1 (Original): An apparatus for providing chemical and biological detection of molecules adsorbed on an organic self-assembled surface, comprising:

a gate contact;

a gate insulator attached to the gate contact;

a source contact attached to the gate insulator;

a drain contact attached to the gate insulator; and;

A  
a semiconductor layer extending between the source and drain comprising an organic monolayer of molecules, each molecule comprising a sensing end group, a conjugated segment covalently bonded to the sensing end group, and an attaching end group covalently bonded to the conjugated segment and attached to the gate insulator.

Claim 2 (Original): The apparatus as recited in claim 1, wherein the sensing end group is selected from the group consisting of halides, nitriles, amines, amides, and ketones.

Claim 3 (Original): The apparatus as recited in claim 1, wherein the attaching end group is selected from the group consisting of trichlorosilyl groups, amines, and carboxylic acid groups.

Claim 4 (Original): The apparatus as recited in claim 1, wherein the conjugated segment is selected from the group consisting of phenyl-acetylene and phenylene-vinylene.

Claim 5 (Original): The apparatus as recited in claim 1, configured such that adsorbed molecules can be selectively removed from the sensing end group by heating the organic self-assembled monolayer and driving off adsorbed species of vapor molecules.

Claim 6 (Original): The apparatus as recited in claim 1, wherein the sensing end group generates an atomically sharp interface for differentiating between vapor molecules.

Claim 7 (Original): The apparatus as recited in claim 1, wherein a substance is detected when the sensing end group adsorbs a threshold amount of a desired vapor molecule.

Claim 8 (Currently amended): An organic self-assembled transistor fabricated on a silicon substrate, the transistor comprising:

a gate contact;

a gate insulator attached to the gate contact;

a source contact attached to the gate insulator;

a drain contact attached to the gate insulator; and

a semiconductor layer between the source and drain, the layer comprising an organic self assembled monolayer of molecules, wherein the molecules of the monolayer each include a sensing end group, a conjugated segment covalently bonded to the sensing end group, and an attaching end group covalently bonded to the conjugated segment and attached to the gate insulator.

Claim 9 (Original): The transistor as recited in claim 8, wherein the organic self-assembled monolayer comprises a pentacene film.

Claim 10 (Original): The transistor as recited in claim 9, wherein the pentacene film is about 10nm thick.

Claim 11 (Canceled)

Claim 12 (Currently amended): The transistor as recited in claim ~~11~~ 8, wherein the sensing end group can be changed to control the chemical properties of the sensing surface.

Claim 13 (Currently amended): The transistor as recited in claim ~~11~~ 8, wherein the organic self-assembled monolayer generates an atomically sharp interface for differentiating between vapor molecules via the sensing end group.

Claim 14 (Currently amended): The transistor as recited in claim ~~11~~ 8, wherein the sensing end group is selected from the group consisting of halides, nitriles, amines, amides, and ketones.

Claim 15 (Currently amended): The transistor as recited in claim ~~11~~ 8, wherein the conjugated segment is selected from the group consisting of phenyl-acetylene and phenylene-vinylene.

Claim 16 (Currently amended): The transistor as recited in claim ~~11~~ 8, wherein the attaching end group is selected from the group consisting of trichlorosilyl, amines, and carboxylic acid groups.

Claim 17 (Currently amended): The transistor as recited in claim ~~11~~ 8, wherein charge carrier density of the sensing end group changes according to the adsorption of vapor molecules.

Claim 18 (Currently amended): The transistor as recited in claim ~~14~~ 8, wherein charge mobility of the sensing end group changes according to the adsorption of vapor molecules.

Claim 19 (Currently amended): The transistor as recited in claim ~~14~~ 8, wherein current pulses heat the organic self-assembled monolayer so that adsorbed species of vapor molecules are removed from the sensing end group.

Claim 20 (Original): The transistor as recited in claim 19, wherein the energy required to heat  $3 \times 10^{-13} \text{ cm}^3$  of the organic self-assembled monolayer is about 15 pJ.

Claim 21 (Currently amended): The transistor as recited in claim ~~14~~ 8, wherein the sensing end group may be removed and replaced without removing the conjugated segment or the attaching end group.

Claims 22-34 (Withdrawn)

Claim 35 (Currently amended): A chemical and biological sensor array system, the system comprising:

an array of organic self-assembled single transistor sensors;

a processing module; and

silicon circuitry connecting the array to the processing module, the sensors each comprising a transistor including a source, a drain, a gate, and a gate insulator; and

a semiconductor self-assembled monolayer channel bonded to the gate insulator between the source and drain of the transistor, the monolayer changing charge mobility and charge density upon adsorption of vapor molecules.

Claim 36 (Original): The system as recited in claim 35, the array of organic self-assembled transistors further comprising at least two organic self-assembled transistor sensors calibrated to detect different vapor molecules.

Claim 37 (Original): The system as recited in claim 36, wherein the processing module monitors differential responses from organic self-assembled transistors in the array, the processing module detecting changes in the differential responses associated with the adsorption of vapor molecule species.

Claim 38 (Original): The system as recited in claim 35, wherein the silicon circuitry configured such that the transistor sensors can be packaged as an integrated circuit where the organic self-assembled transistor sensors are exposed to the testing atmosphere.

Claim 39 (Canceled)

Claim 40 (Currently amended): The system as recited in claim 39 40, wherein the monolayer comprises individual organic monolayer molecules for self-assembly covalently bonded to other surrounding organic monolayer molecules.

Claim 41 (Original): The system as recited in claim 40, wherein the monolayer provides maximum response when each of the molecules adsorbs a desired vapor molecule.

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revised*  
Claim 42 (Currently amended): The system as recited in claim ~~39~~ 40, wherein the monolayer provides measurable transistor response changes to low concentrations of less than  $10^{-16}$  moles of analyte molecules.

Claim 43 (Currently amended): The system as recited in claim ~~39~~ 40, wherein the monolayer provides maximum response in the presence of analyte molecules even at low concentrations of about  $10^{-16}$  moles.

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